

DAFTAR PUSTAKA

- Abdel-tawwab, M., Ahmad, MH., Abdel-Hadi, YM., dan Seden, MEA., 2008. Use Of Spirulina (*Spirulina Platensis*) As A Growth And Immunity Promoter For Nile Tilapia, *Oreochromis Niloticus* (L.) Fry Challenged With Pathogenic *Aeromonas Hydrophila*. *8th International Symposium On Tilapia In Aquaculture*.
- Afify, AE-MM., Romeilah RM., Sultan SI. 2012. Antioxidant activity and biological evaluations of probiotic bacteria strains. *International Journal of Academic Research*, **4** :131-139.
- Agarwal, A., dan Prabakaran SA. 2005. Oxidative Stress and Antioxidants in Male Infertility: A Difficult Balance. *Iranian Journal of Reproductive Medicine*, **1**(3), 1-8.
- Ahmad, R.Z., 2018. Mikoremediasi Menghilangkan Polusi Logam Berat pada Lahan Bekas Tambang untuk Lahan Peternakan. *Jurnal Wartaroz*, **28**(1).
- Alfarisy, M. U., N. Abdulgani dan I. Ulfin. 2013. Pengaruh Jenis Kelamin dan Ukuran Terhadap Kadar Albumin pada Ikan Kurisi (*Channa striata*). *Jurnal Sains dan Seni Pomits*, **2** (1).
- Ali, H., Khan E., Sajad M.A., 2013. Phytoremediation of heavy metals-Concepts and application. *Chemosphere*, **91**: 869-881.
- Alkobaby, AI. dan Abd El-Wahed, RK. 2017. The Acute Toxicity of Copper to Nile Tilapia (*Oreochromis niloticus*) Fingerlings and its Effects on Gill and Liver Histology. *J Aquac Res Development.*, **8**(1): 2 – 6.
- Ana, C.G., Tomislava L. dan Zarcovic N. 2010. Oxidative stress and antioxidant: biological response modifier of oxidative homeostasis in cancer. *Periodicum Biologorum*. **112**(4): 433-439.
- Anonim. 2016. *Peta Sentra Produksi Perikanan Budidaya*. Kementerian Kelautan dan Perikanan. Jakarta.
- Anonim. 2019. Food and Agriculture Organization (FAO): Cultured Aquatic Species Information Programme *Oreochromis niloticus*(Linnaeus,1758). http://www.fao.org/fishery/culturedspecies/Oreochromis_niloticus/en. Diakses pada 20 September 2019.
- Anonim. 2019. *Tilapia*. <https://www.alimentarium.org/en/knowledge/tilapia>. Diakses pada 10 September 2019.
- Arie, U. 2000. *Pembenihan dan Pembesaran Nila Gift*. Penebar Swadaya. Jakarta

- Arifin, Z. 2007. Pentingnya Mineral Tembaga (Cu) Dalam Tubuh Hewan Dalam Hubungannya Dengan Penyakit. *Wartazoa*. **17**(2): 93 – 99.
- Ashish, Badiye, dan Rejesh, KN. 2013. Copper Toxicity: A Comprehensive Study. *Research Journal of Recent Sciences*. **2**: 58 – 67.
- Azwan, M. dan Sunarto, S. 2011. Kandungan Logam Berat Tembaga dan Protein Ikan Nila (*Oreochromis niloticus*) di Keramba Jaring Apung Waduk Gajah Mungkur Wonogiri Jawa Tengah. *Bonorowo Wetlands*. **1**(2): 70 – 79
- Basileios, G., Spyropoulos, Evangelos, P., Misiakos, Constantine F., Christos, N., Stoidis. 2011. Review: Antioxidant Properties of Probiotics and Their Protective Effects in the Pathogenesis of Radiation-Induced Enteritis and Colitis. *Dig. Dis. Sci*. **56**: 285–294.
- Biri, A., Kavutcu. M, Bozkurt. N, Devrim. E, Nurlu. N, Durak. I, 2006. Investigation of Radical Scavenging Enzyme Activities and Lipid Peroxidation in Human Placental Tissue with Miscarriage. *Journal of the Society for Gynecolboppogic Investigation*. **13**(5):384-388.
- Bobrowska-Korczak, B., Skrajnowska, D., and Tokarz, A. 2012. The Effect of Dietary Zinc and Polyphenols Intake on DMBA-Induced Mammary Tumorigenesis in Rats. *J Biomed Sci*. **1**(19) : 43-51.
- Bron, P.A., Kleerebezem M, Brummer RJ. 2017. Can probiotics modulate human disease by impacting intestinal barrier function? *British Journal of Nutrition*. **117**:93-107.
- Bruch, C.G., dan D.P. Janet., 2002, Oxidative Stress In Critically III Patients. *American Journal of Critical care*. **11**(6): 543-551.
- Cahyani, M.C., Azizah. R, Yulianto. B, 2012. Studi Kandungan Logam Berat Tembaga (Cu) pada Air, Sedimen, dan Kerang Darah (*Anadara granosa*) di Perairan Sungai Sayung dan Sungai Gonjol, Kecamatan Sayung, Kabupaten Demak. *Journal of Marine Research*. **1**(2): 73-79.
- Cao, J., Wang, G., Wang, T., Chen, J., Wenjing, G., Wu, P., Xie, L., 2019. Copper Caused Reproductive Endocrine Disruption in Zebrafish (*Danio rerio*). *Aquat. Toxicol*. **211**: 124-136.
- Carocho M. dan Ferreira C.F.R. 2013. A reviews on antioxidants, proxidants and related controversy. Natural and synthetic compounds, screening and analysis methodologies and future perspectives. *Food and Chemical Toxicology*. **51**: 15-25.
- Cholik, FRP., Poernomo, dan Jauzi, A. 2005 . *Aquakultur : Tumpuan Harapan Masa Depan Bangsa. Masyarakat Perikanan Nusantara dan Taman Aquarium Air Tawar – TMII*. PT. Victoria Kreasi Mandiri. Jakarta.

- Connell, D. W dan G. J. Miller. 2006. *Chemistry and Ecotoxicology of Pollution*. A Wiley Interscience Publication. London.
- Crim, L.W., Shenwood, N.M., Wilson, C.E., 1988. Sustained hormon release ii, effectiveness of lhrh analog (lhrha) administration by either single time injection or cholesterol pellet implantation on plasma gonadotropin levels in a bioassay model fish the juvenile rainbow trout. *Aquaculture* **74** (1-2): 87-95.
- Cruz, P.M., Ibanez, A.L., Hermosillo, O.A.M., dan Saad, H.C.R. 2012. Use of Probiotic in Aquaculture. *ISRN Microbiol*.
- Darmono. 2001. *Logam dalam Biologi Makhluk Hidup*. UI Press. Jakarta.
- Dawood, M.A.O., dan Koshio, S., 2016. Recent advances in the role of probiotics and prebiotics in carp aquaculture: A review. *Aquaculture*. 454: 243-251.
- Effendi, H. 2003. *Telaah Kualitas Air Bagi Pengelolaan Sumber Daya dan Lingkungan Perairan*. Penerbit Kanisius. Yogyakarta.
- Effendie, M. I. 1979. *Metode Biologi Perikanan*. Yayasan Dewi Sri. Bogor.
- Ekatriksna, D., Sasanti, AD., dan Muslim. 2013. Population bacteria, water quality of media maintenance, and histology of snakehead (*Channa striata*) fry feeding by artificial feed with probiotic. *Jurnal Akuakultur Rawa Indonesia*, **1**(1) : 90-102.
- Eyckmans, M., Celis. N, Horemans. N, Blust. R, De Boeck. G. 2011. Exposure to waterborne copper reveals differences in oxidative stress response in three freshwater fish species. *Aquatic Toxicology* **103**: 112–120.
- Feng, P., Z. Ye, A. Kakade, AK. Virk, X. Li, dan P. Liu. 2019. A Review on Gut Remediation of Selected Environmental Contaminants: Possible Roles of Probiotics and Gut Microbiota. *Nutrients*, **11**(22).
- Fitriyah, A. W., Utomo, Y., dan Kusumaningrum, I. K. 2012, Analisis Kandungan Tembaga (Cu) dalam Air dan Sedimen di Sungai Surabaya, *Jurnal Online Universitas Negeri Malang*.
- Forsyth, C. B., Farhadi, A., Jakate, S. M., Tang, Y., Shaikh, M., dan Keshavarzian, A. 2009. *Lactobacillus* GG treatment ameliorates alcohol-induced intestinal oxidative stress, gut leakiness, and liver injury in a rat model alcoholic steatohepatitis. *Alcohol*. **43**: 163-172.
- Froese, R. dan D. Pauly. Editors. 2003. FishBase. *Oreochromis niloticus* (Linnaeus, 1758). <https://www.marinespecies.org> . Diakses pada 10 September 2019.
- Gatesoupe, F. J. 1999. The Use of Probiotics in Aquaculture. *Aquaculture*. **180** (2-

3): 147-165.

- Ghufran, MH., dan Kordik, K. 2009. *Budidaya Perairan*. PT. Citra Aditya Bakti. Bandung.
- Ginting, C. N. 2017. Studi Khasiat Daun Katu (*Sauropus androgynus*) dalam Mengatasi Keracunan Ion Tembaga Berdasarkan Gambaran Histopatologi Ovarium Tikus Betina. *Disertasi*. Program Pascasarjana Universitas Andalas, Padang.
- Gioacchini, G., Lombardo, F., Merrifield, D.L., Silvi, S., Cresci, A., Avella, M.A., and Carnevali, O. 2011. Effects of probiotic on zebrafish reproduction. *Journal of Aquaculture Research and Development*.
- Halttunen, T., S. Salminen, R. Tahvonen. 2007. Rapid removal of lead and cadmium from water by specific lactic acid bacteria *International Journal of Food Microbiology* **114**, 30–35.
- Hayati, A. 2017. *Spermatologi*. AUP Press. Surabaya.
- Hedianto, YE., Lisyastuti, E., Najmiyati, E., Gani, YY. 2003. Pengaruh Pemaparan Cd dan Cu Terhadap Abnormalitas Spermatozoa Ikan Mas (*Cyprinus carpio* Linn). *Jurnal Iktiologi Indonesia*. **3**(1).
- Hiskia, A. 2001. *Kimia Larutan*. Citra Aditya Bakti. Bandung.
- Ho, Y.C., K.Y. Show, X.X. Guo, I. Norli, F.M.A. Abbas, dan N. Morad. 2012. *Industrial Discharge and Their Effect to the Environment*. Malaysia InTech.
- Irianto, A. 2003. *Probiotik Akuakultur*. Gadjah Mada University Press. Yogyakarta.
- Iribarren, D., P. Dagá dan M. T. Moreira., G. Feijoo. 2012. Potential environmental effects of probiotics used in aquaculture. *Aquacult Int* **20**:779-789.
- Isradji, Israhanto. 2011. Pengaruh Pb-Asetat Terhadap Berat dan Volume Testis Mencit. *Sains Medika.*, **3**(2); 150-156.
- Jiang, J., Wu. Y.X, Zhou. Q.X, Feng. L, Liu. Y, Jiang. D.W, Wu. P, Zhao. Y, 2016. Glutamate ameliorates copper-induced oxidative injury by regulating antioxidant defences in fish intestine. *British Journal of Nutrition*. **116**, 70–79.
- Jin, Y., Luan, Y., Ning, Y. dan Wang, L. 2018. Effects and Mechanisms of Microbial Remediation of Heavy Metals in Soil: A Critical Review. *Applied Sciences*, **8**(8): 1-17.
- Khasani, I. 2007. Aplikasi Probiotik Menuju Sistem Budidaya Perikanan

- Berkelanjutan. *Jurnal Media Akuakultur*. **2**(2): 86-149.
- Kohen, R. dan Nyska. A. 2002. Oxidation of Biological System: Oxidative Stress Phenomen, Antioxidants, Redox Reactions, and Methods for Their Quantification. *Toxicology Pathology*. **30**(6): 620-650.
- Kullisaar, T., Zilmer, M., Mikelsaar, M., Vihalemm, T., Annuk, H., Kairane, C., Kilk, A. 2002. Two antioxidative *Lactobacilli* strains as promising probiotics. *Int. J. Food Microbiol.* **72**: 215-224.
- Lin MY, Yen CL. 1999. Antioxidative Ability of Lactic Acid Bacteria. *J Agric Food Chem.* **47**(4): 1460-1466.
- Lushchak, V.I, 2011. Environmentally induced oxidative stress in aquatic animals. *Aquatic Toxicology*. **101**: 13-30.
- Mansyur, A. dan Tangko, AM. 2008. Probiotik : Pemanfaatannya Untuk Pakan Ikan Berkualitas Rendah. *Media Akuakultur*. **3**(2): 145-149.
- Mehrim, AI, Khalil FF, Hassan ME. 2019. Sexual Maturity Signs and Histological Alteration of Adult *Oreochromis Niloticus* (Linnaeus 1758) Fed Probiotic. *Int J Anat and Appl Physiol*. **5**(1):103-110.
- Mikhsalmina, Muchlisin, ZA., dan Dewiyanti, I. 2017. Effect of Different Concentration of the Oil Clove (*Syzygium aromaticum*) as Anesthetic on the Survival Rate of Milkfish (*Chanos chanos*) Post Larvae During Transportation. *Jurnal Ilmiah Mahasiswa Kelautan dan Perikanan Unsyiah*. **2**(2) : 295-301.
- Mosa, KA, Saadoun I, Kumar K. 2016. Potential biotechnological strategies for the cleanup of heavy metals and metalloids. *Frontiers in Plant Science*. **7**: 303.
- Mujalifah, Santoso, H., dan Laili, S. 2018. Kajian Morfologi Ikan (*Oreochromis niloticus*) dalam Habitat Air Tawar dan Air Payau. *E-Jurnal Ilmiah Biosaintropis*. **3**(3) : 10-17.
- Ogórek, M., Lenartowicz, M., Starzyński, R., 2017. Atp7a and Atp7b regulate copper homeostasis in developing male germ cells in mice [J]. *Metallomics*. **9** (9),1288–1303.
- Palar, H. 2004. *Pencemaran dan toksikologi logam berat*. PT Rineka Cipta. Jakarta.
- Parameswari, W., Ade D.S., dan Muslim. 2013. Populasi Bakteri, Histologi, Kelangsungan Hidup Pertumbuhan Benih Ikan Gabus (*Channa striata*) Yang Dipelihara Dalam Media Dengan Penambahan Probiotik. *Jurnal Akuakultur Rawa Indonesia*. **1**(1): 76-89.

- Patowary, K., Patowary, R., Kalita, M. C. dan Deka, S. 2016. Development of an Efficient Bacterial Consortium for the Potential Remediation of Hydrocarbons from Contaminated Sites. *Frontiers in Microbiology*. **7**: 1092.
- Prasetio, E., M.Mursin, E.I.Raharjo dan Farida. 2015. Pengaruh Serbuk Lidah buaya (*Aloe vera*) sebagai Imunostimulan terhadap Tingkat Kesembuhan dan Histopatologi Ikan Nila yang Diinfeksi dengan Bakteri *Aeromonas hydrophila*. *Majalah Ilmiah Al Ribaath*. **12**(2): 58-67.
- Prousek, J., 2007. Fenton chemistry in biology and medicine. *PureAppl. Chemospher*. **79**: 2325–2338.
- Purwanta, W., dan Firdayati, M. 2002. Pengaruh Aplikasi Mikroba Probiotik Pada Kualitas Kimiawi Perairan Tambak Udang. *Jurnal Teknologi Lingkungan*. **3**(1):62-65.
- Putra, A. N. 2010. Kajian Probiotik, Prebiotik dan Sinbiotik Untuk Meningkatkan Kinerja Pertumbuhan Ikan Nila (*Oreochromis niloticus*). *Tesis*. Program Pasca Sarjana Institut Pertanian Bogor, Bogor.
- Rachmianti, M. M. 2013. Analisis Kandungan Logam Berat Seng (Zn) dan Tembaga (Cu) Pada Ikan Nila dan Perairan Waduk Cirata Purwakarta, Jawa Barat. *Skripsi*. Fakultas Perikanan dan Ilmu Kelautan IPB, Bogor.
- Rahmawati, H. dan Hartono, D. 2012. Strategi Pengembangan Usaha Budidaya Ikan Air Tawar. *Jurnal Penelitian Pengelolaan Sumberdaya Alam dan Lingkungan*. **1**(2).
- Ramlah., E.Soekendarsi, Z. Hasyim, dan M. S. Hasan. 2016. Perbandingan Kandungan Gizi Ikan Nila (*Oreochromis niloticus*) Asal Danau Mawang Kabupaten Gowa dan Danau Universitas Hasanuddin Kota Makassar. *Jurnal Biologi Makassar*. **1**(1):39-46.
- Sakhaee, E., Emadi, L., Abshenas, J., Kheirandish, R., Azari, O., dan Amiri, E. 2012. Evaluation of Epididymal Sperm Quality Following Experimentally Induced Copper Poisoning in Male Rats. *Andrologia*. **44**: 110 – 116.
- Saparinto, Cahyo dan Rini Susiana. 2011. *Kiat Sukses Budi Daya Ikan Nila*. Lily Publisher. Yogyakarta.
- Schut, S., Zauner, S., Hampel, G., König, H., dan Claus, H. 2011. Biosorption Of Copper By Wine-Relevant Lactobacilli. *International Journal Of Food Microbiology*. **145**: 126–131.
- Shukla, V., Dhankhar, M., Prakash, J., Sastry, K.V. 2007. Bioaccumulation of Zn, Cu and Cd in *Channa punctatus*. *Journal of Environmental Biology*. **28**(2): 395-397.

- Siregar, TH., dan Murtini, JT. 2008. Kandungan Logam Berat Pada Beberapa Lokasi Perairan Indonesia Pada Tahun 2001 Sampai Dengan 2005. *Jurnal Squalen*. **3**(1).
- Solang, M. 2010. Indeks Kematangan Gonad Ikan Nila (*Oreochromis Niloticus* L) yang Diberi Pakan Alternatif dan Dipotong Sirip Ekornya. *Saintek*. **5**(2).
- Sugiyono. 2012. *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D*. Alfabeta. Bandung.
- Suranjana, R. H. dan Bhattacharyya. M. 2014. Oxidative Stress: Lipid Peroxidation Product as Predictors in Disease Progression. *J Exp Integr Med* **4**, 151-64.
- Suyanto, R. 2003. *Nila*. Penebar Swadaya. Jakarta.
- Takashima dan T. Hibiya. 1995. *An atlas of fish histology, Normal and Pathological Feature Second Edition*. Kodansha Ltd. Tokyo.
- Tan, X.Y., Luo Z, Liu X, Xie X. 2011. Dietary copper requirement of juvenile yellow catfish *Pelteobagrus fulvidraco*. *Aquaculture Nutrition* **17**: 170–176.
- Thompson, H.S dan R.M. Clarkson. 2000. Antioxidant : what role they play in physical activity and health?. *Am J. Clin. Ntr.* **72**: 6375-6465.
- Trewavas, F. 1982. Tilapias: Taxonomi and Speciation. In R.S.V. Dullin and R.H. Low Mc. Connell (Eds). *The Biology and Culture of Tilapias. ICLARM Convergence, Mamalia*.
- Tvardá, E., Rohan, P., Suresh, CS., dan Ashok, A. 2015. Iron And Copper In Male Reproduction: A Double-Edge Sword. *J Assist Reprod Genet.* **32**(1): 3 – 16.
- Ummah, R. I. 2015. Pengaruh Kadmium Terhadap Struktur Histologi Insang Ikan Lele (*Clarias batrachus*). *Skripsi*. Fakultas Sains dan Teknologi UNAIR, Surabaya.
- Uribe, M.C., Grier, H.J., Mejia-Roa, V. 2014. Comparative Testicular Structure and Spermatogenesis in Bony Fishes. *Spermatogenesis* **4**(3): 1 – 13.
- Valko, MH., Morris, MTD., dan Cronin. 2005. Metals, Toxicity, and Oxidative Stress. *Current Medicinal Chemistry*. **12**: 1161 – 1208.
- Vílchez, M.C., Santangeli, S., Maradonna, F., Gioacchini, G., Verdenelli, C., Gallego, V., Peñaranda, D.S., Tveiten, H., Pérez, L., Carnevali, O., & Asturiano, J.F. 2015. Effect of the probiotic *Lactobacillus rhamnosus* on the expression of genes involved in European eel spermatogenesis. *Theriogenology*, **84**(8): 1321–1331.

- Wang, X., Sun, Y., Wang, L., Li, X., Qu, K., dan Xu, Y., 2017. Synbiotic dietary supplement affects growth, immune responses and intestinal microbiota of *Apostichopus japonicus*. *Fish and Shellfish Immunology*. **68**: 232-242.
- Werdhasari, A. 2014. Peran Antioksidan Bagi Kesehatan. *Jurnal Biotek Medisiana*. **3**(2).
- Widayati, A. 2017. Pengaruh Pemberian Minyak Buah Merah (*Pandanus conoideus Lam*) Terhadap Kadar *Malondialdehyde* dan Kualitas Spermatozoa Pada Mencit (*Mus musculus*) yang Dipapar *Monosodium Glutamate*. Tesis. Fakultas Kedokteran Universitas Airlangga, Surabaya.
- Winarsi, H., 2007. *Antioksidan Alami dan Radikal Bebas: Potensi dan Aplikasinya dalam Kesehatan*. Kanisius. Yogyakarta
- Wiriyanta, BW., Sunaryo, Astuti, dan Kurniawan, MB. 2010. *Buku Pintar Bisnis Ikan Nila*. Agro Media Pustaka. Jakarta.
- Wootton, R. J. dan C. Smith. 2014. *Reproductive Biology of Teleost Fishes*. John Wiley-Blackwell, Oxford.
- Zarei, M., Aminzadeh, S., Ghorohi, A., Motalebi, AA., Alikhajeh, J., dan Daliri, M. 2012. Chitinase Isolated From Water And Soil Bacteria In Shrimp Farming Ponds. *Journal of Fisheries Science*. **11**: 911-925.
- Zen, M. A. 2017. Analisis Kadar Timbal dan Kromium Yang Terkandung Dalam Air Dan Insang Ikan Bader Putih (*Barbonymus gonionotus*) dan Bader Merah (*Barbonymus balleroides*) di Daerah Aliran Sungai Brantas. *Skripsi*. Fakultas Sains dan Teknologi Universitas Airlangga, Surabaya.
- Zerbib, D. 2017. Bacterial Cell Envelopes: Composition, Architecture, and Origin. *Handbook of Electroporation*. 417-436.
- Zhang, Y., Du, R., Wang, L., Zhang, H. 2010. The antioxidative effects of probiotic *Lactobacillus casei* Zhang on the hyperlipidemic rats. *Eur. Food Res. Technol.* **231**:151–158.
- Zoghi, A., Khosravi-Darani, K. dan Sohrabvandi, S. 2014. Surface Binding of Toxins and Heavy Metals by Probiotics. *Mini-Reviews in Medicinal Chemistry*. **14** (1): 8498.
- Zultamin., Muslim dan Yulisman. 2014. Pematangan Gonad Ikan Kurisi Betina (*Channa striata*) Menggunakan Hormon *Human Chorionic Gonadotropin* Dosis Berbeda. *Jurnal Akuakultur Rawa Indonesia*, **2** (2): 162-174.